Shipboard Pipe Flushing Acid Waste

19 May 2004

FY04 Y0817 Program Review

Technical POC
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Objectives

- To develop an integrated pierside system for recycle/reuse and treatment of acid/heavy metal wastewater generated from shipboard seawater heat exchanger pipe flushing operations

DoD EQ Requirements

- Navy's Environmental Quality (EQ) Requirements:
  - # 2.II.01.q, "Control/Treat industrial wastewater discharges."
  - # 3.I.13.a, "Reuse/recycle of Hazardous/Polluting Materials"
- EQ Requirement Priority: High

Problem Statement/Regulatory Drivers

- Each chemical flushing process for shipboard heat exchangers generates up to 15,000 gallons of hazardous waste (hydrochloric acid, heavy metals, and toxic)
- Contractors disposal cost ranges from $2 to $12 per gallon and the Navy is still liable for spills, accidents or mis-handling
- Chemical flushing process is more effective than the mechanical process. However, the large volume, high disposal cost and hazardous nature of the waste generated have discouraged other potential users

Approach

- Visit operation sites and gather wastewater samples for pollutants characterization
- Develop process performance and design parameters for recycle, reuse, and treatment to meet the discharge limits
- Initial COTS technology alternative evaluation
- Design and fabricate a selected prototype system
- Conduct a Dem/Val at a selected shipyard
- Deliver a proven operation system to the end user
- Prepare an implementation document, UDP

Technology Description

- A portable integrated pierside system to recycle and reuse the chemical solution and to treat the waste to meet the dischargeable limits

Conceptual Integrated Pierside System

Before/After Comparison

	Before	After
Waste Disposal Cost	High	Low
Hazardous Waste	Yes	No
Navy-wide Usage	Low	High

Expected DoD Benefits
(Environmental/Economic Benefits)

- 75% reduction of fresh water and chemical cost
- $1M annual savings at each shipyard from disposal of shipboard pipe flushing HW
- Reduce liability for chemical spills, accidents or mis-handling en route to the vendor's processing facility

Milestones

Milestones	Completion Date
1. Visit operation sites and waste characteristics evaluation	Jun/04
2. Develop process performance and design parameters	Aug/04
3. COTS technology alternative evaluation	Dec/04
4. Design and fabricate a prototype system	Apr/05
5. Conduct A Dem/Val at a selected shipyard	Oct/05
6. Deliver a proven system to the end user	Mar/06
7. Prepare User Data Package (UDP)	Apr/06

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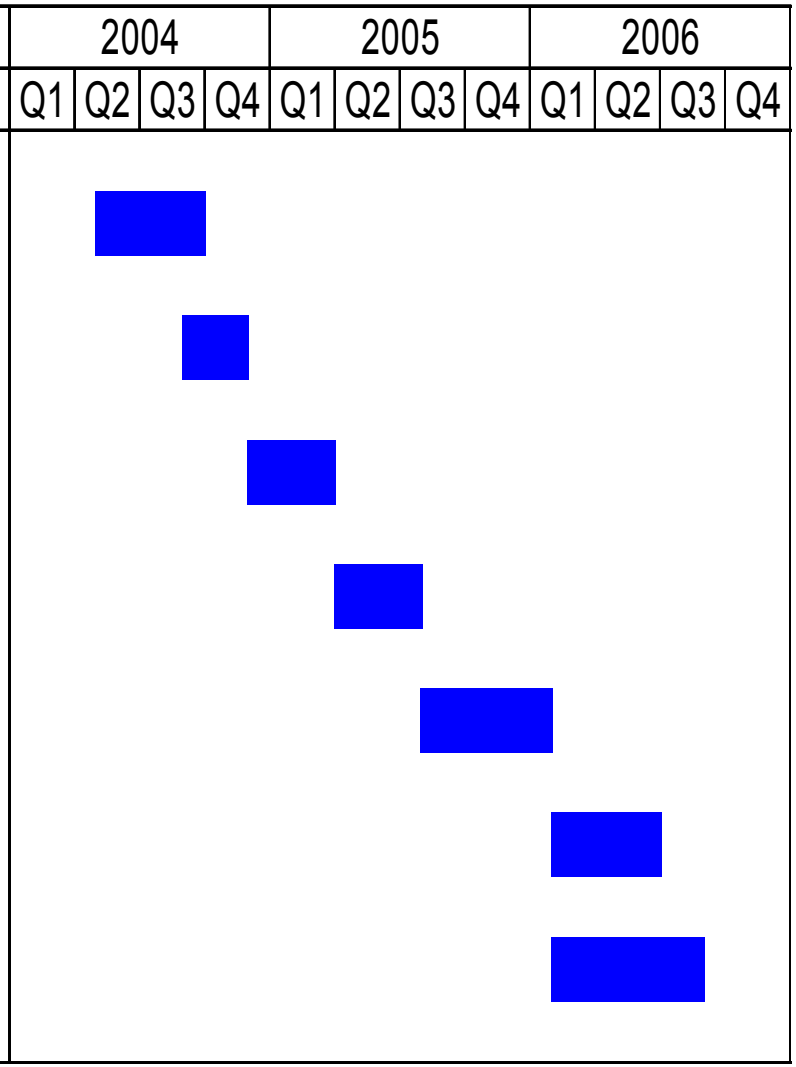
ID	Task Name
1	Visit operation sites and waste characterization
2	Develop process performance and design parameters
3	COTS technology alternative evaluation
4	Design and fabricate a prototype system
5	Conduct a Dem/Val at a selected shipyard
6	Deliver a proven system to the end-users
7	Prepare User Data Package (UDP)



Project Coordination

- NSY Puget Sound Code 260.3, Mr. Paul Stirling
- NSWC Code 632, Mr. Tom Judy
- NAVSEA 05M32, Mr. Fred Tsao
- NAVSEA 07T, Mr. Dave Cartwright
- NAVSSES, NSWCCD, Mr. Frank Reyes, Code 9234

Technical Accomplishments to Date

- Obtained historical wastewater lab test data
- Visited two operation sites and collected wastewater samples for lab analytical tests
- Established collaborative effort with NSWCCD

Test Results for Pipe Flushing Wastewater

Pollutants	Puget Sound	Norfolk	Point Loma	Pearl Harbor	Effluent Limits
Copper (mg/l)	1460	230/230	1910/1870	1640	3.31
Nickel (mg/l)	485	140/140	670/410	686	3.89
Zinc (mg/l)	140	79	150	167	2.55
Chromium (mg/l)	3	0.3	2.2	2.8	2.71
COD (mg/l)	N/A	11,000	15,000	N/A	TBD
BOD (mg/l)	N/A	1,640	1,730	N/A	TBD

Implementation Strategy Accomplishments and Plans

- Disseminate Tech Transfer documents, UDP to potential end-users
- Identified potential users:
  - Puget Sound Naval Shipyard
  - SUBASE Point Loma, San Diego
  - North Island, Navy Station, San Diego
  - Norfolk Naval Shipyard
  - Pearl Harbor Naval Shipyard
  - Portsmouth Naval Shipyard
  - Mayport Naval Station

Logic Model for Shipboard Pipe Flushing Acid Waste

Navy Benefits	A Navy-wide annual savings of $5M in disposal costs
Customer Capability	To recycle and reuse the chemical cleaning solution prior to the treatment and disposal
Product	An integrated pierside recycle/reuse/treatment system
Project Milestones	MS#5: Conduct Dem/Val (Q1, FY06) MS#6: Deliver a proven operational system to the end user (Q2, FY06)

Shipboard Pipe Flushing Acid Wastewater

- Develop a pierside system to recycle/reuse/treat chemical flushing solution
- Reduce hazardous wastewater generation & disposal cost
- Reduce Navy's liability for any spills and accidents
- Estimated annual savings of $1M for each shipyard
- ROI = 10